Release Notes for IWFM Version 2015.0.257

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This version of IWFM includes several important new simulation capabilities, several bug fixes and a modified input file structure (for groundwater, subsidence, small watersheds and unsaturated zone components) compared to the previous version. The new features are:

1. Optional simulation of stream wetted perimeter as a function of stream flow depth to properly simulate flows and stream-aquifer interaction in channels with flood plains
2. Optional simulation of stream flows using kinematic wave routing approach
3. Root water uptake from groundwater
4. Access of riparian vegetation to stream flow to meet part or all of their evapotranspirative demand
5. Improved modularity both in the code and in the input data structure to promote easy data entry and easy linkage of IWFM components to other models
6. New unsaturated zone budget output
7. New output for groundwater flow velocities at cell centroids as well as TecPlot-compliant output for nodal groundwater flow velocities
8. Improved small watershed budget tables

The changes to the code are as follows:

1. **(04/16/2013)** The source code as well as the input data files are restructured so that each simulation component (groundwater, subsidence, unsaturated zone and small watersheds)

can be treated as a separate entity. This improved modularity which will allow easier linkage of IWFM components to other models in the future.

2. **(04/30/2013)** Unsaturated zone budget can now be generated.
3. **(05/22/2013)** Simulation of root water uptake from groundwater is implemented.
4. **(06/11/2013)** Simulation of riparian evapotranspiration being met by stream flows is implemented.
5. **(07/30/2013)** Small watersheds budget tables are improved to include full water budget for all hydrologic components simulated for small watersheds (root zone, groundwater, net surface and subsurface flow contribution into model domain).
6. **(08/02/2013)** A new feature to define stream wetted perimeter as a function of stream flow depth is implemented. This will allow the proper simulation of stream flows and stream-aquifer interactions at channels with flood plains.
7. **(12/19/2013)** An error that led to complete skipping of the simulation of tile drains is corrected.
8. **(03/01/2014)** Groundwater flow velocities at cell centroids can now be printed out. Additionally, a velocity output file that can readily be processed by TecPlot can be generated.
9. **(03/10/2014)** When streams or lakes were not simulated, some arrays were not dimensioned properly in Pre-Processor which caused errors in Simulation. This error is corrected.
10. **(05/07/2014)** Lakes now except direct runoff and return flow as inflow. Lake budget file is modified so that the contribution of direct runoff and return flow to lake storage can be listed.

11. **(05/12/2014)** The Newton step calculated in iterative solution of the conservation equations is now scaled back after 30 iterations to improve stability of the solution method.
12. **(07/07/2014)** In certain cases soil moisture simulation using Newton-Raphson method did not converge due to the effect of evapotranspiration function (when evapotranspiration goes from zero to non-zero). To remedy this issue, the code is changed such that if the number of iterations is greater than 10% of the maximum number of iterations, only half of the Newton step is used, instead of the full step.
13. **(07/14/2014)** Potential evapotranspiration that reflects user input data for different land-use types is now printed in the root zone budget tables so that the user can compare actual evapotranspiration with the potential.
14. **(07/18/2014)** An error in reading groundwater head hydrograph data when the hydrograph location was given as a node was corrected.
15. **(07/21/2014)** Thickness of the unsaturated layer was sometimes computed too small which created issues with iterative simulation. This is corrected by checking if the thickness is less than 1×10^{-10}. If it is, the thickness is assumed zero.
16. **(07/29/2014)** Kinematic wave approach is implemented as an optional method to route stream flows.